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January 16, 1837.

G. R. PORTER, Esq., Vice-President, in the Chair.

The following members were elected :—

William Augustus Miles, Esq., 26, Bury Street, St. James's ;  
John Ward, Esq., 1, John Street ;  
T. F. Triebner, Esq., 2, Union Court, Old Broad Street.

The names of the following candidates were proposed, and were ordered to be suspended, in accordance with the Regulations of the Society.

James Mahon, Esq., 7, Gray's Inn Square ;  
William Youatt, Esq., 46, Grove Street, Camden Town ;  
John Brown, Esq., Wareham, Dorsetshire ;  
Edmund Clark, Esq., Lincoln's Inn.

The following distinguished gentlemen were elected Fellows of the Society, as foreign members.

Baron Humboldt ;  
Il Giudice Arpino, Finance Minister to H. M. the King of Naples ;  
M. Van der Maelen, Founder of the Geographical Establishment of Bruxelles ;  
M. Hoffman, President of the Royal Statistical Board of Berlin ;  
M. Dieterici, Vice-President                      Ditto              Ditto.

The following Paper was read :—

“ A Statistical Account of the Mineral Products obtained in France, during the years 1832-3 ; taken from official documents.”  
By G. R. PORTER, Esq., Vice-President.

The Author stated, as a preliminary observation, that although it is to the mineral treasures of Britain that we are principally indebted for the means of prosecuting the modes of industry which have made our country the first in manufactures and commerce, yet that, no systematic effort has ever been made to acquire authentic information of the state and extent of this course of our wealth and power. That, it is a tacit reproach to the nation, that while we are content to remain in ignorance of the statistics of our iron and coal mines—which are our most important mineral treasures—a French gentleman, M. Le Play, officially deputed by the French Government, has recently visited, and ascertained the nature, produce, and capability of every iron work, and nearly every coal field in the United Kingdom. It was stated as probable that an account of these researches would be laid before the Statistical Society.

Mr. Porter then proceeded with the immediate subject of the Paper, stating that, the French Government had established a Board of Commissioners, under the control of the Minister of the Interior: the objects of which Board are indicated by its title—“*Direction Générale des Ponts et Chaussées et des Mines.*” It has under its orders a staff of well educated engineers, part of whose duty it is to collect statistical details of the works which they are appointed to inspect. A Report, in which these details are contained, has been published, in which the amount and value of the mineral industry of each department of France, during the above mentioned period, are given with a degree of minuteness and accuracy at once satisfactory and practically useful. The Paper then gave an abstract of the results of this Report.

The subject is divided under the six following heads:—

1. Iron Works.
2. Fuel.
3. Metals other than Iron.
4. Salt, Alum, and Copperas (Sulphate of Iron.)
5. Quarries.
6. Various operations connected with mineral substances.

## 1st. IRON.

More than two-thirds of the value created in France by mining industry belongs to its Iron Works. These are spread over a great part of the kingdom, there being only 12 out of the 86 Departments into which it is divided where Iron Works do not exist.

The value created in 1832-3 by this branch of industry was :—

|       |             |           | £.      | £.        |
|-------|-------------|-----------|---------|-----------|
| in 14 | Departments | less than | .....   | 4,000     |
| .. 8  | .. „ ..     | between   | 4,000   | and 8,000 |
| .. 4  | .. „ ..     | .. „ ..   | 8,000   | „ 12,000  |
| .. 7  | .. „ ..     | .. „ ..   | 16,000  | „ 20,000  |
| .. 16 | .. „ ..     | .. „ ..   | 20,000  | „ 40,000  |
| .. 9  | .. „ ..     | .. „ ..   | 40,000  | „ 80,000  |
| .. 4  | .. „ ..     | .. „ ..   | 80,000  | „ 120,000 |
| .. 4  | .. „ ..     | .. „ ..   | 120,000 | „ 160,000 |
| .. 1  | .. „ ..     | .. „ ..   | 160,000 | „ 200,000 |
| .. 1  | .. „ ..     | .. „ ..   | 200,000 | „ 240,000 |
| .. 2  | .. „ ..     | .. „ ..   | 240,000 | „ 280,000 |
| .. 1  | .. „ ..     | .. „ ..   | 292,664 |           |

The 13 Departments in which the yearly value exceeded 80,000*l.* were, in the order of their productiveness, as follows :—

|                 |         |         |         |
|-----------------|---------|---------|---------|
| Haute Marne...  | 292,664 | Nièvre. | 128,025 |
| Ardennes. ....  | 245,559 | Cher.   | 124,269 |
| Haute-Saône ..  | 242,607 | Meuse.  | 114,271 |
| Cote d'or. .... | 227,991 | Ariège. | 86,977  |
| Moselle. ....   | 177,168 | Vosges. | 85,349  |
| Doubs. ....     | 158,367 | Jura.   | 80,585  |
| Loire. ....     | 149,605 |         |         |

The 12 Departments in which there are neither Iron Mines nor Iron Works are :—

|                      |              |                 |
|----------------------|--------------|-----------------|
| Alpes, Basses.       | Creuse.      | Lozère.         |
| Alpes, Hautes.       | Finisterre.  | Seine-et-Marne. |
| Cantal.              | Gers.        | Somme.          |
| Charente-Inférieure. | Loire-Haute. | Vendée.         |

The total quantity of ore extracted from the Iron Mines of  
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France in 1832-3, amounted to 1,551,473 \*tons, of which the value was 144,252*l.*, which is considerably increased by the cost of labor in dressing the ore, and of carriage to the furnaces, which last item somewhat exceeds the value of the ore when first raised.

The proportions in which these elements enter into the cost of the ore ready for smelting are :—

|                                 |       |       |
|---------------------------------|-------|-------|
| Extraction .....                | —     | . 385 |
| Dressing, viz. Washing .....    | . 166 |       |
| Roasting .....                  | . 015 |       |
|                                 | —     | . 181 |
| Carriage to Washing works ..... | . 147 |       |
| to Roasting .....               | . 015 |       |
| Smelting .....                  | . 272 |       |
|                                 | —     | . 434 |
|                                 |       | —     |
|                                 |       | 1.000 |
|                                 |       | —     |

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\* Or 15,750,990 Metrical Quintals. Throughout this paper English quantities and currency have been substituted for the French. One ton equals  $10\frac{2}{11}$  Metrical Quintals.

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The following Statement exhibits the value of the French Iron manufacture, distinguishing each process; with the number of Works for conducting the same, and the cost of each process, in the year 1832-33 :—

| WORKS.   | No.  | Quantities of Metal produced. | Value of Metal Produced. |          | Cost of Processes. |          |
|--|------|-------------------------------|--------------------------|----------|--------------------|----------|
|  |      |                               | Total.                   | per Ton. | Total.             | per Ton. |
|  |      | Tons.                         | £                        | £ s. d.  | £                  | £ s. d.  |
| Smelting Furnaces making $\frac{5}{8}$ Pig Iron, }<br>and $\frac{1}{8}$ Castings. } .. | 374  | 221.886                       | 1,623,719                | 7 6 0    | 1,297,502          | 5 6 11   |
| Reverberatory do. for remelting Pig Iron ..  | 59   | 15.492                        | 288,365                  | 18 12 3  | 142,575            |          |
| Cupolas for ditto ..   | 132  |                               |                          |          |                    |          |
| Furnaces, Crucible, converting the Ore by one Process into Iron. ....                  | 97   | 8,351                         | 138,002                  |          | } 109,527          |          |
| Steel .....  |      | 399                           | 8,577                    |          |                    |          |
| Forges for converting Cast into Malleable Iron .....                                   | 1230 | 131.863                       | 2,251,390                | 17 1 7   | 1,062,970          | 8 1 3    |
| Rolling, Drawing and Slitting Mills .....  | 1556 | 68,976                        | 1,637,156                | 23 14 8  | 298,884            | 4 6 8    |
| Refineries for converting Iron into Steel .....  | 69   | 6,170                         | 174,737                  | 28 6 5   | 78,935             | 12 15 10 |
| Cementing Stoves for ditto .....   | 28   | 320                           | 22,223                   | 69 8 9   | 10,563             | 33 0 0   |
| Monling Furnaces .....   | 54   | 3,655                         | 201,106                  | 55 0 0   | 64,332             | 17 14 9  |
| Tilt Hammers .....   | 94   |                               |                          |          |                    |          |
| Number of Seythes forged .....   | ..   | No. forged                    |                          |          |                    |          |
| Files .....  | ..   | 273,366                       |                          |          |                    |          |
| doz. .....   | ..   | 135,588                       |                          |          |                    |          |
| bundles .....  | ..   | 358,309                       |                          |          |                    |          |
| To which add   |      |                               | 93,472                   |          | 51,910             |          |
| Value created by extracting the Ore .....  | ..   | .....                         | .....                    | .....    | 141,252            |          |
| dressing ..  | ..   | .....                         | .....                    | .....    | 67,528             |          |
| Carriage to the Furnaces &c. ....  | ..   | .....                         | .....                    | .....    | 163,080            |          |
| Total Value of the French Iron Manufacture   |      |                               |                          |          | 3,492,519          |          |

Of the Fuel used in the Iron Manufacture five-sixths in value was the produce of the forests of France. The remainder consisted of Bituminous Coal and turf or peat. The actual and proportionate value of each kind of fuel employed was :—

|                     |                        |
|---------------------|------------------------|
| Wood Charcoal ..... | £ 1,214.816 — 0. 838   |
| Coal .....          | 140.340 — 0. 098       |
| Coke .....          | 89.127 — 0. 062        |
| Wood .....          | 4.970 — 0. 003         |
| Turf .....          | 84 — 0. 000            |
|                     | <hr/>                  |
|                     | £1,449.337      1. 000 |
|                     | <hr/>                  |

The proportions in which the cost of Fuel extend into the expense of the various processes of manufacture were as follows :—

|   |             |
|---|-------------|
| Roasting the ore — (only a small quantity being submitted to that process.) ..... | 1. 790      |
| Smelting the ore .....  | 843. 188    |
| Remelting Pig Iron .....  | 18. 405     |
| Conversion into malleable Iron .....  | 485. 670    |
| ———— of ore into malleable Iron and Steel .....                                   | 7. 793      |
| Rolling, Drawing, Slitting, &c .....  | 45. 200     |
| Making and Working Steel .....  | 47. 893     |
|   | <hr/>       |
|   | 1. 449. 337 |
|   | <hr/>       |

The total quantity of Metallic Iron produced from ores raised in France, including 8,930 Tons of malleable Iron and Steel made by the Corsican method, was 230,816 Tons, the cost of Fuel therefore for each Ton amounted to 6*l.* 5*s.* 7*d.*—The expense under the heads of roasting and smelting the ore was 3*l.* 16*s.* 2*d.* per Ton ; for converting Pig into malleable Iron 3*l.* 13*s.* 8*d.* per Ton.

The number of workmen employed was .... 31. 704. viz.

|   |         |
|---|---------|
| In raising the ore .....  | 11. 397 |
| Dressing „ .....  | 2. 312  |
| Roasting „ .....  | 250     |
| Smelting „ .....  | 3. 898  |
| Casting Iron .....  | 1. 978  |
| Making Malleable Iron .....   | 6. 952  |
| In Rolling and Drawing Mills, &c ..                                   | 3. 197  |
| In converting and manufacturing }<br>Steel, making Scythes, &c .... } | 1. 720  |
|   | <hr/>   |
| Total.  | 31. 704 |
|   | <hr/>   |

The above number is exclusive of the persons employed in transporting the ore, in procuring fuel, carbonizing wood and coal, and conveying them to the smelting works and forges.

#### FUEL.

Coal mines are worked in 34 of the departments of France, but in most of them, only to a very small extent. Four-fifths of the entire production are drawn from the four departments of

|        |                 |
|--------|-----------------|
| Loire, | Saône-et-Loire, |
| Nord,  | and Aveyron.    |

One-tenth of the annual produce is yielded by the seven departments of

|              |              |                       |
|--------------|--------------|-----------------------|
| Gard,        | Haute-Loire, | Tarn,                 |
| Calvados,    | Bas Rhin,    | and Loire-Inferieure. |
| Haute-Saône, |              |                       |

The remaining tenth is furnished by 23 departments, the produce of some among them being extremely small.

The number of coal mines is stated to be 209, of which only 140 were worked during the year. The quantity of coal extracted was 1,550,530 tons, the value of which at 7*s.* 6*d.* per ton amounted to 581,448*l.*

*LIGNITE* is found in 14 departments, chiefly in those bordering on the Mediterranean. About three-fifths of the entire produce is procured in the department of the mouths of the Rhone, where it is made to serve a great variety of manufacturing processes, and is used also for domestic purposes. The number of mines of this mineral is 75, only 48 of which were in operation in the year. The produce amounted in quantity to 69,177 tons, and in value to 22,314*l.* The number of workmen employed in raising this produce was 760.

*ANTHRACITE* is produced in the four departments of

|          |                   |
|----------|-------------------|
| Isère,   | Sarthe,           |
| Mayenne, | and Hautes Alpes. |



In the first and the last-named of these departments Anthracite is used for various purposes, but chiefly for heating dwellings, in burning limestone, in plaster works, and for making nails. Mixed with bituminous coal it answers well in Iron Works. Anthracite is also used for heating bakers' ovens and for burning bricks and tiles. In La Mayenne and La Sarthe this fuel is consumed solely for burning lime to be used for improving the soil, the fertility of which has thus been greatly increased in the neighbourhood of the mines. These have been worked for only a few years; their produce has been quadrupled since 1828, and is still rapidly increasing. Out of 32 mines, 24 are in activity and yielded in the year 38,398 tons, the value of which was 20,483*l.*, and the number of workmen employed was 533.

*MINERAL BITUMEN* is found in the three departments of

L'Ain,                      Puy-de-Dôme,                      and Bas Rhin.

This branch of industry is at present greatly on the increase.

The bituminous matter is found in different degrees of purity. When freed from foreign matter it is used for various purposes under the different names of Bitumen, Graisse-noire, Petroleum, &c. It is used either alone or in combination with vegetable bitumen, for preserving wood-work exposed to weather, cordage, and wooden pipes or spouts, but its principal employment is that of greasing axletrees and machinery, for which purpose it is preferred to common cart-grease. It is likewise carbonized, and in that state, under the name of mineral black, is used in the same way as animal charcoal for discharging the colour from various substances.

The quantity of purified bituminous products amounted in the year to 870 tons, and its value to 7,025*l.* The number of mines is six, of which five were in operation, employing 182 workmen.

*PEAT* is found in greater or less quantity in more than 40 of the departments of France. In some few of these it has been procured for many centuries, but in the greater part, through

ignorance or prejudice, the inhabitants have not availed themselves of its advantages until the present century.

The two departments of the Pas de Calais and La Somme, yield annually 19,424,350 cubic feet of this fuel, the value of which is 52,000*l*. The seven departments of

|                   |           |           |
|-------------------|-----------|-----------|
| Loire-Inferieure, | Bas Rhin, | L'Aisne,  |
| Oise,             | Vosges,   | and Nord, |
| Seine et Oise,    |           |           |

produce together 14,126,800 cubic feet, valued at 44,000*l*.

In the whole of France the quantity is about 42,380,400 cubic feet, valued at 120,000*l*. The collection of this fuel is made during three or four months in the summer, when it affords employment to 40,000 persons—men, women and children.

It thus appears that the number of persons employed in raising and collecting Mineral Fuel, Bituminous Matter, and Peat, amounts to 55,600, and that the value created by their labour amounts to 770,212*l*.

#### LEAD.

The Lead Mines of France, 29 in number, are situated in 18 departments, but only 10 mines are now productive.

These 10 are in the departments of

|              |            |            |
|--------------|------------|------------|
| Finisterre,  | Isere,     | Rhone,     |
| Lozere,      | Haut Rhin, | and Loire, |
| Puy de Dôme, | Gard,      |            |

The produce during the year was—

|               |                     | £.           |
|---------------|---------------------|--------------|
| Silver,       | 4,442 lbs. troy wt. | value 18,572 |
| Lead,         | 499 tons            | value 7,268  |
| Litharge, &c. | 317 tons            | value 5,075  |

The subsequent processes of the conversion of pig lead into sheets, pipes, &c. &c. add 40,000*l*. to the value of the metal.

The number of workmen employed are—

|                               |       |
|-------------------------------|-------|
| Miners .....                  | 581   |
| In subsequent processes ..... | 571   |
|                               | <hr/> |
|                               | 1,152 |
|                               | <hr/> |

A very small part, not above one-sixteenth, of the lead used in France is of home production. The deficiency is principally supplied from Spain.

### SILVER.

Argentiferous deposits have been found in the departments of Finisterre, Isère, and Haut Rhin, but the only mine which at present yields any profitable return is at Huelgoat in the first-named of these departments. The ore which it yields is smelted together with the lead ore obtained in Finisterre, and has been included in the above statement of the produce of the Lead Mines.

### COPPER.

There are only nine Copper Mines in France, situated in the five departments of

|                     |            |
|---------------------|------------|
| Herault,            | Haut Rhin, |
| Haute Loire,        | and Rhone, |
| Pyrenées Orientale, |            |

all in the south and south-east parts of the kingdom. Only two of these mines are in operation, and the produce of these is inconsiderable, and rapidly decreasing. In the year the total produce amounted only to 135 tons. There are numerous works in France on a large scale for the manufacture of various articles of Copper, Brass and Bronze, but the metallic copper used is almost wholly of foreign production, and chiefly that of Russia and England.

*ANTIMONY* is found in the mountains of Auvergne and the Vivarais, but the quantity produced is but small, and amounted in the year to only 101 tons, valued at 2,849*l*. The number of

workmen employed in extracting the ore and founding the metal, is 112.

### MANGANESE.

There are five mines from which this mineral is obtained in the departments of,

|                 |            |
|-----------------|------------|
| Saône et Loire, | Cher,      |
| Allier,         | and Rhone. |
| Dordogne,       |            |

Manganese is known to exist in some other parts of France.

The produce of the five mines is stated as having been, in the year, 1,039 tons, valued at 4,206*l*. The number of workmen employed was 130.

### SALINE SUBSTANCES.

Under this head are included Common Salt—(Chloride of Sodium); Copperas—(Sulphate of Iron); Alum—(Sulphate of Alumina and Potass). The first of these substances, Common Salt, is procured chiefly from the evaporation of sea-water, but partly also from mines of fossil salt and saline springs impregnated by fossil salt.

The departments in which salt is obtained from the evaporation of sea-water admitted into reservoirs or salt marshes, are twelve in number, viz.

|                      |                   |                      |
|----------------------|-------------------|----------------------|
| Charente Inférieure, | Bouches du Rhone, | Pyrenées Orientales, |
| Loire Inférieure,    | L'Aude,           | Morbihan,            |
| La Vendée,           | Herauld,          | Corsica,             |
| Gard,                | Var,              | Isle et Vilaine.     |

Fully one-fourth part of the entire quantity obtained is made in the department of Charente Inférieure.

Brine springs exist in the seven departments of

|                  |               |
|------------------|---------------|
| La Meurthe,      | Moselle,      |
| Jura,            | Ariège,       |
| Doubs,           | and Bas Rhin. |
| Basses Pyrenées, |               |

Fossil salt is extracted in the two departments of La Meurthe and Haute Saône.

The proportions in which salt is procured from these different sources are,

|                                     |       |
|-------------------------------------|-------|
| From evaporation of Sea-water ..... | .905  |
| From Brine springs .....            | .058  |
| From mines of fossil salt.....      | .037  |
|                                     | <hr/> |
|                                     | 1.000 |
|                                     | <hr/> |

The quantity of these productions was 407,250 Tons, value 568,351*l*.

This quantity is found to be sufficient for the consumption of the country and to leave upwards of 50,000 tons for exportation, principally to Sardinia and Switzerland.

The Aluminous and Pyritic Substances, from which Copperas and Alum are made, are obtained in the following eight departments :

|           |                   |
|-----------|-------------------|
| Aisne,    | Seine-Inferieure, |
| Bas-Rhin, | Vaucluse,         |
| Oise,     | Gard,             |
| Ariège,   | and Ardèche.      |

The number of mines in operation was 16, and the number of people employed 924, of whom 449 work in the mines, and 475 in the preparation of the Salts.

The produce of Alum, in the year, was 2,330 tons, valued at 33,228*l*. The quantity of Copperas 3,177 tons, valued at 12,765*l*.

Under the two remaining heads, viz. No. 5, Quarries, and No. 6, Various Operations connected with Mineral Productions, the commissioners have not given any details, the returns which they possess being as yet incomplete ; but they state generally that the mass of products thus comprised amounts in value to a greater sum than the whole of the substances of which details have been given in their report.

Recapitulation of the quantities raised, the value created, and number of workmen employed in the different mining operations carried on in France as detailed in the foregoing pages.

|                           | Workmen<br>employed | Quantities<br>raised. | Value<br>created.     |
|---------------------------|---------------------|-----------------------|-----------------------|
| Iron and Steel . . .      | 31.704              | 230.816 Tons          | £ 3.492.519           |
| Coal . . . . .            | 55.600              | 1.550.530 ..          | 770.212               |
| Lignite . . . . .         |                     | 69.177 ..             |                       |
| Anthracite . . . . .      |                     | 38.398 ..             |                       |
| Mineral Bitumen . . . . . |                     | 870 ..                |                       |
| Peat . . . . .            |                     | 1,569.644 cubic ft.   |                       |
| Silver . . . . .          | 1.214               | 4.442 lbs. Troy       | 33.867                |
| Lead & Litharge &c. }     |                     | 816 Tons              |                       |
| Copper . . . . .          | 258                 | 135 ..                | 9.907                 |
| Antimony . . . . .        | 124                 | 101 ..                | 5.477                 |
| Manganese . . . . .       | 130                 | 1.039 ..              | 4.206                 |
| Salt . . . . .            | not stated          | 407.250 ..            | 568.351               |
| Alum . . . . .            | 924                 | 2.330 ..              | 33.228                |
| Copperas . . . . .        |                     | 3.177 ..              | 12.765                |
|                           | <hr/> 80.954 <hr/>  |                       | <hr/> 4.930.534 <hr/> |